5. CONSERVATION STRATEGY AND PROCEDURES

5.1 Biological Goals

The two primary, measurable goals of this HCP are: a) to ensure the protection of covered species habitat, and b) to limit the increase in human-induced mortality of Key deer so that no significant negative effect on the species occurs.

The following measures will ensure habitat protection:

- The loss of native habitat will be severely restricted under this HCP: Native habitat loss caused by development activities over the next 20 years will be limited to no more than 0.5% of the current native habitat area.
- Land development regulations will direct development activities to areas of low habitat quality. No more than 2 percent of the total impact over 20 years will be allowed in Tier 1 areas (H = 0.02).
- A land acquisition program to protect habitat areas in perpetuity.
- Habitat management of acquired lands.

The number of human-induced deaths for Key deer varies year to year and is significantly correlated with a measure of deer density (Figure 5.1). The goal of this HCP is to ensure that development activities do not result in a significant increase in the relative occurrence of human-induced mortality of Key deer.

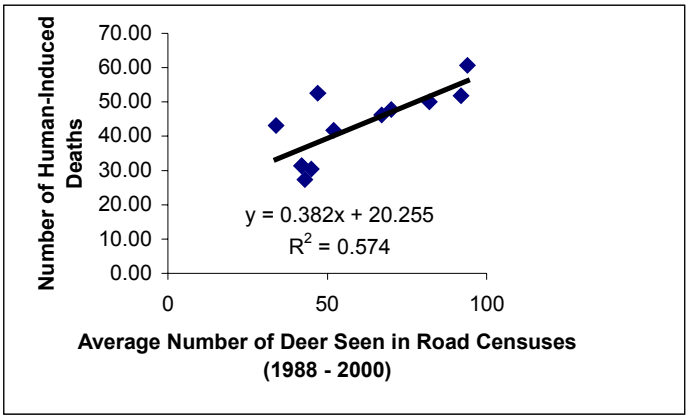

Figure 5.1. Relationship between human-induced Key deer mortality and deer density. Data from USFWS, and Roel Lopez (pers. comm.)

5.2 Summary of Take and Its Effects on the Covered Species

Under this HCP, the Applicants will carry out covered activities progressively over 20 years. All development activities combined over the 20-year period will have a maximum cumulative impact of H = 1.0. For H = 1.0, the resulting probability that the population will fall below 50 females at least one in 50 years and the average additional total annual human-induced mortality are, respectively:

$$\text{Percent Risk}_{(50)} = 2.2e^{0.58*1.0} = 4.0\%$$

$$\text{Additional Annual Human-Induced Mortality} = -0.65*1.0^2 + 4.85*1.0 - 0.34 = 3.9 \text{ deer/year}$$

Thus, the PVA model predicts that the combined effect of 20 years of development for a total H = 1.0 would raise the probability that the population will fall under 50 females at least once in 50 years by 1.7 percent (from 2.3 to 4.0 percent) and increase human-related Key deer mortality by 3.9 deer a year. Additionally, the probability of extinction in 100 years is <0.1 percent, nearly undistinguishable from current conditions.

No direct loss of Lower Keys marsh rabbit or silver rice rat habitat is anticipated as a result of development activities. No new residential or commercial development will be allowed on marsh rabbit habitat or within 500 meters of accessible marsh rabbit habitat. Development activities likely to occur within the 500-meter buffer area are limited to roadway expansions and the expansion of two existing churches not to exceed more than 2,500 square feet of floor area per church. These types of development usually do not bring up typical causes of indirect impacts to marsh rabbits, namely domestic predators such as cats. However, minor secondary effects may occur. Housing development activities may occur in subdivisions within 500 meters from marsh rabbit habitat; these areas are largely inaccessible to the marsh rabbit due to roads or canals. Thus residential development is expected to have no direct effect on the marsh rabbit. Community facilities, commercial development, and other infrastructure development will occur either outside areas of concern for the marsh rabbit or on parcels already altered and of no value to the marsh rabbit. Moreover, road widening activities will not be allowed in marsh rabbit habitat.

Development activities were estimated to result in the loss of up to approximately 7.1 acres of native vegetation, affecting pinelands, hammocks, and freshwater wetlands (Table 5.1). This represents a loss of about 0.1 percent of native habitat in the HCP covered area and a minor direct effect or take on the covered species.

Construction activities will cause temporary and localized indirect impacts in the vicinity of the construction areas. After construction, other indirect effects may remain, such as edge effects. Given that the majority of the activities contemplated in the 20-year development plan will occur in areas of low habitat quality or on already disturbed areas, indirect and secondary effects are expected to be minimal.

Table 5.1. Estimated loss of native vegetation from covered activities

Type of Development	Acres of Habitat Cleared		
	Pineland	Hammock	Wetland
Residential	0.3	0.8	N/A
Commercial	N/A	N/A	N/A
Community/	N/A	N/A	N/A
Recreational Facilities	N/A	N/A	N/A
Institutional uses	1.0	N/A	N/A
Public	N/A	N/A	N/A
Facilities	N/A	N/A	N/A
	N/A	N/A	N/A
Transportation	2.0	1.0	2.0
Improvements	N/A	N/A	N/A
Other Proposed	N/A	N/A	N/A
Activities	N/A	N/A	N/A
Total:	3.3	1.8	2.0

5.3 Conservation Strategy - Mitigation Measures and Procedures

The conservation program is focused primarily on strict avoidance and minimization measures, habitat mitigation based on replacing lost habitat value, and the protection and management in perpetuity of acquired habitat. The main goal of the Plan is to mitigate for the anticipated incidental take of covered species in accordance with the requirements for issuance of a Section 10(a)(1)(B) ITP.

5.3.1 Conservative Assumptions and Level of Take

The reported level of take, H = 1.0, is used in this HCP to measure the maximum amount of impacts over 20 years and to establish the level of impact to be mitigated. The model assumes that the entire impact of H = 1.0 is incurred at the outset of the model run. In practice, H = 1.0 will be accrued over 20 years. The progressive increase in impact levels will allow the Key deer to adapt to changing circumstances, whereas the assumption that all impacts occur at once increases the impact estimates in the model runs.

The model assumed total habitat loss for newly developed or redeveloped parcels, as well as for the facilities expansion. The Key deer uses all available open areas, including developed areas. However, the PVA model assumes that any development results in the loss of the entire parcel. For example, 200 developed residential lots in Pine Channel States contribute 1.8 Key deer to the carrying capacity of the study area (i.e., K = 1.8).

However, the model assumes that 200 new houses will contribute nothing to the carrying capacity. Therefore, the model overestimates the impact of development and provides a conservative support to planning for development activities.

The Applicants chose to evaluate a more stringent population viability measure. Recent PVA and conservation literature recommends that conservation planners evaluate shorter-term risks to make management decisions (Akcakaya 2000, Akcakaya and Sjogren-Gulve 2000). The Key deer PVA model can estimate a variety of risk timeframes. For example, extinction risk may be expressed as the probability of extinction of the Key deer in 100 years. Historically, the Key deer population dwindled to less than 50 individuals, but rebounded with the implementation of protection measures (see Section 1.2.1). The Applicants chose to use the risk that the population fall below 50 females at least once in 50 years as a more conservative and realistic measure of risk in evaluating potential development activities. This more stringent indicator guided subsequent viability and incidental take analyses.

Finally, the PVA model predicts and average of 3.9 additional human-induced Key deer deaths per year. The number of human-induced Key deer deaths varies from year to year, but is strongly correlated with a measure of deer density (Figure 5.1). Therefore, the ratio "deaths/deer seen" provides an indicator of the potential effects of development on the relative occurrence of human-induced deaths. If development impacts are small, and other factors remain the same, future development should not significantly increase the ratio. For the last 13 years (1988-2000), the mean ratio of human-induced Key deer deaths and average deer seen in censuses is:

deaths/average deer seen = 1.38
Standard deviation = 0.28
95% confidence interval = (1.23 – 1.53)

The predicted average increase in human-induced mortality (3.9 deer) would fall within the 95% confidence interval, suggesting that no significant increase in the ratio should occur as a consequence of the proposed level of take. For example, an increase of four deer deaths in each of the last 11 years would have produced a mean ratio of 1.48, which is well within the 95% confidence interval. The overall effect of the proposed level of development over 20 years is expected to fall be within the existing yearly variability.

5.3.2 Avoidance and Minimization

Avoidance and minimization measures were applied at every step in the preparation of the HCP. First, the Applicants made key decisions, discussed above, in the development and use of the Key deer PVA model, which resulted in a conservative approach to modeling.

Second, development activities in the project area will occur in accordance to the following guidelines, which ensure avoidance and minimization of impacts to the Key deer and other covered species:

- The total impact over 20 years will not exceed H = 1.0.

- Clearing of native habitat will be limited to parcels to be developed for residential use or for local road widening. The total amount of clearing over 20 years will be limited to no more than 0.2 percent of the current extent of native habitat in the project area (15 acres). No clearing of native habitat, other than that necessary and authorized for residential development or local road widening, will be allowed.

- Development in Tier 1 areas will be limited to no more than five percent of all residential units permitted over the 20-year period or a total H = 0.02 (two percent of the total H), whichever results in a lower H.

- No development other that single family residential will be permitted in Tier 1.

- No development which may interfere with Key deer movement along the corridor will be permitted within Sands Subdivision. With the completion of the Key deer underpasses and the proposed widening of US-1 along the business segment on Big Pine Key, native habitat in the Sands Subdivision area constitutes the main corridor connecting Key deer habitat south and north of US-1 (Figure 5.2).

- Residential and commercial development will occur progressively over 20 years, thus minimizing the extent of construction impacts that occur at any given time.

- Commercial development will be limited to infill in existing commercial areas on Tier 2 and Tier 3 lands, mainly along the US-1 corridor on Big Pine Key. This includes all current commercially zoned areas south of Lytton's Way. All new commercial development would be limited to disturbed or scarified lands, as defined in the Monroe County Code (9.5-4 [D-14][S-2]). Clearing of pinelands and/or hammock will not be permitted for commercial development activities.

- Recreational and community facilities development would be restricted to existing developed areas that are either already publicly owned or that would be acquired for that purpose.

- Minor recreational and community facilities will be restricted to areas within existing improved subdivisions.

- Community organizations' development will be restricted to expansions, on existing applicant-owned land, up to the buildable area limits per Monroe County Code.

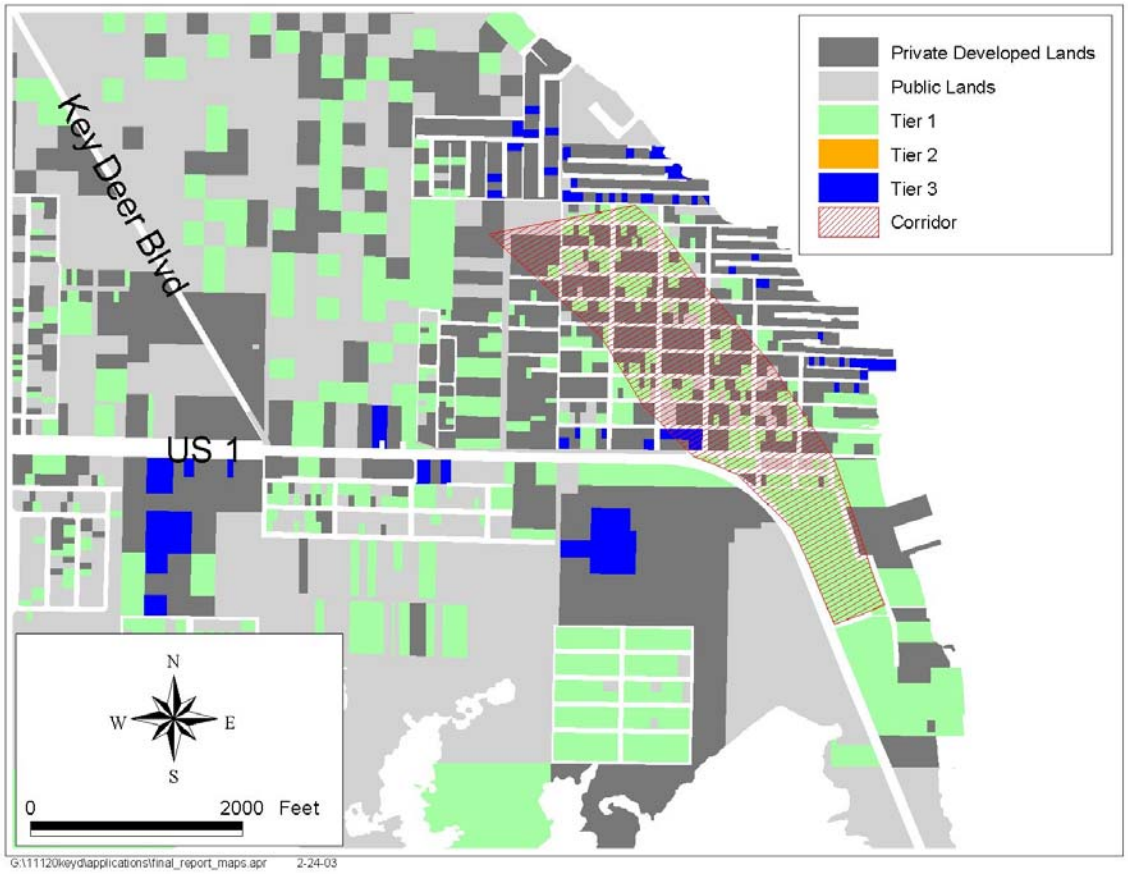

Figure 5.2 Key deer corridor across Sands Subdivision

- Speed limits, traffic calming devices, and other measures will be applied to lower the probability of Key deer/vehicle collisions on County roads.

- Public infrastructure development will be restricted to disturbed lands as defined in the Monroe County Code (9.5-4 [D-14][S-2]).

- No fences will be allowed in Tier 1 lands, except Port Pine Heights and Kyle-Dyer Subdivisions.

- No additional fences will be allowed in the US-1 commercial corridor.

- Fences will be subject to restrictions and guidelines established in agreement with the USFWS.

- FDOT will avoid impacts to wetland during US-1 three-laning.

- Accessory uses will be permitted for lots adjacent to existing developed lots only in Tier 2 and Tier 3 lands. Residential accessory uses would be limited to those listed in the Monroe County Code (Chapter 9.5-4[A-2]).

- No development will be allowed in Lower Keys marsh rabbit habitat. No residential or commercial development will be allowed within 500 meters of marsh rabbit habitat, with the exception of isolated areas per Figure 2.2.

- Road widening activities along US-1 would occur within existing cleared and filled portions of the existing FDOT ROW.

5.3.3 Habitat Mitigation and Habitat Banking

The Applicants propose to mitigate for the incidental take of covered species by acquiring and managing native habitat areas within the HCP project area. The harvest grid used in the PVA (see Section 3) provides a measure of habitat quality and potential secondary effects (i.e., increased human-induced mortality) on the Key deer. It also provides a simple currency to compare impacts versus mitigation.

This HCP proposes a level of incidental take that results in a total increase of H = 1.0. The Applicants will mitigate incidental take impacts by acquiring and managing habitat areas at a 3:1 ratio, using H as the currency. Therefore, over 20 years, lands for a total H = 3.0 will be acquired and managed. Land acquisition will occur in advance of or simultaneously with development activities. Should the cumulative $H_{acquired}$ lag the cumulative H_{impact} by five percent a any time during the 20-year permit, Monroe County will halt development permit issuance until sufficient $H_{acquired}$ is available.

During the building moratorium, Monroe County has continued to acquire lands for conservation. Monroe County issued 12 development permits - during a temporary lifting of the moratorium in 1996 - as well as 266 fencing permits. The Applicants propose to use the H value of acquired parcels, after taking into account permits issued for residential units and fences at a 3:1 ratio, as part of the overall mitigation required under this HCP. The proposed mitigation H, accrued through land acquisition is H = 0.3999 (Table 5.2).

Table 5.2. Impacts and mitigation in Big Pine Key and No Name Key, 1995 – present

Mitigation (acquisition, credit)		
Properties acquired from 3/15/95 to 11/13/98		H = 0.5211
Properties acquired from 1999 through 2002		H = 0.2646
	Total:	H = 0.7857
Impacts (permits, debits)		
Fences (266 permits)		H = 0.1118
Building permits (12 permits)		H = 0.0168
	Total:	H = 0.1286

Habitat Banking Credit Calculation	
H required to mitigate impacts at 3:1	H = (0.1286*3) = 0.3858
Credit Requested ($H_{acquired} - H_{required}$)	H = (0.7857 – 0.3858) = 0.3999

5.3.4 Habitat Management

Monroe County will manage all natural lands acquired under this HCP, either directly or indirectly through agreements with other managing entities. Lands in the project area acquired for the HCP will comprise lands purchased by the Monroe County Land Authority (MCLA) for the Florida Forever Program and lands purchased by the MCLA in accordance with the Monroe County Comprehensive Plan.

Lands acquired through the Florida Forever Program, either during HCP development or throughout the 20-year life of the ITP, will be managed by the Service in accordance with existing practices and lease agreement. These lands are part of the Coupon Bight/Key deer CARL project and encompass 3,452 acres of undeveloped land between the Coupon Bight Aquatic Preserve and the Refuge on Big Pine Key. No formal management plan exists for these lands; however, these lands will likely be included in the Refuge Comprehensive Conservation Plan (CCP) to ensure a unified habitat management approach. The Refuge CCP is anticipated to be completed by 2006.

The Monroe County Land Steward is responsible for managing all other lands acquired by the MCLA either during HCP development or throughout the 20-year life of the ITP. Habitat management activities for these lands will vary depending on the habitat quality, presence of rare species and the character of the adjoining lands. Larger tracts of contiguous pineland habitat will be managed in conjunction with Federal and State agencies and the Lower Keys Wildland Fire Hazard Reduction Initiative. Prescribed burning activities on these lands will be conducted in accordance with the Fire Management Plan for Big Pine Key and No Name Key, which is in preparation.

Other county lands acquired under the HCP will be primarily individual undeveloped lots that cannot be burned due to the proximity of development. These lands will be maintained free of solid waste and non-native invasive plants and allowed to grow to hammock vegetation. The Land Steward will conduct additional management efforts as needed, including trash removal, invasive exotic plant control and other issues related to natural resource management. Management of mitigation lands will commence no later than 120 days following acquisition of land in fee title.

5.3.5 Regulatory Actions

Monroe County will enact land development regulations which will follow the guidelines for a rate of growth and development standards described in this HCP. Since 1992, Monroe County has successfully administered a Rate of Growth Ordinance, which directs growth into disturbed areas and protects environmentally sensitive lands. The County has awarded 2,014 Rate of Growth Ordinance (ROGO) allocations since July 1992, of

which only about six percent of the total were awarded to parcels with environmental sensitive characteristics. Nearly half of this six percent were awarded to affordable housing projects.

This HCP limits the proportion of permits in environmentally sensitive areas to five percent of all residential units permitted over 20 years or a total H = 0.02 (two percent of the total H over 20 years), whichever results in a lower total H.

The Master Plan for Future Development of Big Pine Key and No Name Key (Appendix A), in preparation, will direct the rate of growth and development standards in the project area. The master plan will follow the avoidance and minimization guidelines described in this HCP.

5.3.6 Other Considerations

With this HCP, the Applicants consolidate their efforts to provide for the protection of the Key deer and other covered species in the project area. For example, ongoing land acquisition has increased the amount of habitat protected in perpetuity. Beginning in 1993, the Florida Department of Transportation invested approximately $12 million to study, plan and execute projects to reduce highway mortality of Key deer and improve safety on US-1 in Big Pine Key.

In addition to co-funding the development of this HCP, the FDOT has also funded the following studies, for a total of $252,500, which are consistent with recovery plans for covered species in the project area:

- Development of a Methodology for Determining Optimum Locations for Wildlife Crossings on State Highways Using a Geographic Information System (GIS) Approach, with Application to Key Deer on Big Pine Key: $18,994.
- Evaluation of Deer Guards for Key Deer, Big Pine Key: $45,000.
- Evaluating Reintroduction as a Conservation Strategy for Lower Keys Marsh Rabbit: $18,000.
- Effectiveness of Fencing, Underpasses, and Deer Guards in Reducing Key Deer Mortality on the US-1 Corridor, Big Pine Key: $170,506.

5.4 Monitoring and Reporting

The Applicants will carry out biological and compliance monitoring to ensure that the biological goals and the commitments made in this HCP are met.

Biological monitoring of the Key deer will focus on assessing the relative occurrence of human-induced mortality. The main objective of the biological monitoring is to determine if human-induced mortality is increasing beyond the levels observed in recent years. Specifically, the biological monitoring will test the null hypothesis that, as development activities proceed in the project area, there will be no significant increase in

the relative incidence of human-induced mortality. Based on the statistical relationship between human-induced deaths and the mean number of deer seen in standard field censuses (Sections 5.1 and 5.2), the ratio of human-induced deaths to mean number of deer seen should remain below 1.53 during the 20-year permit period.

The USFWS conducts weekly population counts and monthly deer census. The Applicants will conduct a yearly census to supplement and verify data from the USFWS (Table 5.3). Census data will provide the "average number of deer seen." Also, the Applicants will request Key deer mortality data the USFWS collects. Mortality data will provide the "number of human-induced deaths." The ratio will then be calculated for the reporting period and compared against the reference value, 1.53.

The Applicants will also review the USFWS mortality data every year to determine if new spatial patterns emerge, or if any other change in the mortality patterns occur which may be explained by the additional development.

During construction activities of county facilities and road expansion activities, the County biologist will conduct regular monitoring to ensure that development is occurring in accordance with the conditions of the Plan.

Population surveys of the other covered species will not be conducted since the effects on these species are anticipated to be minimal. For these species, only habitat loss data will be compiled.

Table 5.3. Projected budget for monitoring Key deer population for 20-year period.

Item/Service	Annual Costs	Costs for 20-year Plan
Marking supplies	500	10,000
Trapping/surveys	1,000	20,000
Travel costs (2 trips)	3,000	60,000
Data analysis/reporting	500	10,000
Total Costs	**$5,000**	**$100,000**

Compliance monitoring will include an annual compilation of the amount of development completed and acres converted, number of acres acquired, and a summary of habitat management activities by Monroe County. The total H for development and acquisition will be determined using the spatial model and the appropriate land use H conversion factors.

Documentation of habitat management activities will be conducted by the Monroe County Land Steward for lands acquired under the HCP, that are not part of the Coupon Bight/Key deer CARL project. Habitat management activities should parallel land acquisition efforts, that is, the amount of land acquired by the MCLA annually, outside of the Coupon Bight/Key deer CARL project, should be equivalent to that which is

managed. The Monroe County Land Steward will submit an annual summary of the number of the county's habitat management activities.

Monroe County is responsible for ensuring that these monitoring activities are funded and implemented. Actual monitoring efforts will be conducted by the Monroe County Growth Management Division, MCLA, Monroe County Biologist and the Monroe County Land Steward. Monitoring activities will be detailed and summarized in an annual report for the 20-year life of the ITP.

5.4.1 Reporting

Monroe County will prepare and submit an annual HCP Report to the Service at the end of the reporting year. The reporting period will cover January 1 through December 31 and will be submitted by March 31 following the end of the reporting period. The report will address both the biological monitoring and the compliance monitoring. The report will include the following information:

- Biological Information:
    - Results of the Key deer census, including the calculation of the average number of deer seen.
    - A summary of Key deer mortality information, including the calculation of the number of human-induced deaths. Human induced deaths include those due to road kills, entanglement, attacks from domestic predators, and poaching.
    - A discussion and interpretation of mortality data.
    - An assessment of whether the ratio of the number of human-induced deaths to average deer seen remains below 1.53.

- Compliance Information:
    - A list and map of development activities approved and completed.
    - The H value associated with each activity and the total H value of all activities for the year.
    - The cumulative H value of all development since permit issuance.
    - A discussion of observation made during construction monitoring.
    - A list and map of parcels acquired in the reporting year.
    - The H value for each parcel and the total H value of parcels acquired during the reporting period.
    - The cumulative H value of all acquisition since permit issuance including the mitigation credit of H = 0.3999 discussed above.
    - A discussion of management activities conducted during the reporting year.
    - An assessment of the status of all mitigation parcels, addressing the extent of invasion by exotic species, trash disposal, and other potential human-induced impacts.
    - A statement confirming that mitigation has occurred as to maintain a 3H:1H ratio with respect to development activities.
    - Any other pertinent information relative to the implementation of the HCP.

5.6 Adaptive Management/Unforeseen Circumstances/"No Surprises"

Adaptive management provisions in HCPs aim at reducing risk to the species due to significant data or information gaps. The Key deer has been extensively studied (Lopez 2001) and ongoing research programs at Texas A&M University are addressing the Key deer, the silver rice rat and the Lower Keys marsh rabbit. The Key deer PVA model is the state-of-the-art and will likely be fully applicable unless conditions change dramatically. No further studies are proposed as part of this HCP.

Under the "No Surprises" policy establishes a clear commitment from the Federal government to honor its agreements under an approved HCP for which the permittee is in good faith implementing the HCP's terms and conditions (USFWS 1996). The HCP handbook (USFWS 1996) states that the Service will not require the commitment of additional land or financial compensation beyond the level of mitigation, which was provided in the HCP.

The success of the proposed mitigation strategy relies heavily on the willingness of landowners to enter into a sales agreement with the Applicants. Should unwilling sellers prevent the County from accomplishing the mitigation goals, Monroe County will halt the issuance development permits until willing sellers become available. Under no circumstance will the County issue permits if mitigation is not assured; to the extent practicable, land acquisition will occur in advance to incurring impacts.

Should the relative occurrence of human-induced mortality surpass 1.53 for two consecutive years, the County will halt the issuance of permits until consultation with the FWS is completed and a decision on how to proceed is made.

Finally, monitoring the success of this HCP depends on annual data the FWS gathers. Should the FWS stop gathering deer density and mortality data, other options to gather these data should be agreed upon between the Applicants and the Service.